Networking IntelliVue Patient Monitors

Technical Data Sheet

Philips IntelliVue Clinical Network on a Customer-Supplied Network

Description

Philips IntelliVue Clinical Network (ICN) carries physiological waves, parameters and alarms used for patient surveillance. Philips has experience designing and deploying clinical networks that deliver patient data quickly and securely to multiple destinations. From bedside monitoring to ambulatory patient-worn monitoring, the Philips network provides a seamless fabric that keeps clinicians connected to their patients. Philips offers several network options designed to meet the networking strategies of hospital organizations. Philips provides turnkey networks, including the Philips Smart-Hopping solution as well as network solutions that allow Philips IntelliVue Patient Monitors to safely reside on the customer's enterprise IT network, including the 802.11 wireless local area network (WLAN).

Why deploy on the hospital infrastructure?

The challenges with operating medical devices such as patient monitors on hospital networks require clinical engineering, biomedical and IT organizations to work closely together. The decision to leverage the hospitals enterprise network for life critical patient monitoring is not for all hospital organizations. For some organizations, deploying Philips IntelliVue Patient Monitors on their network gives greater control and visibility of Philips networked devices. It's recommended that this approach include a risk management strategy such as IEC 80001-1:2010.

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How does Philips do it?

Philips can deploy the IntelliVue Patient Monitoring network on the hospital's enterprise network using virtual local area networks (VLANs) and leveraging IT networking best practices. Detailed networking performance specifications and configurations outline performance requirements for your infrastructure to support the IntelliVue solution. This specification is known as Philips Customer Supplied Clinical Network (CSCN) specification. Wireless performance requirements and configuration specifications for 802.11 infrastructure vendors are also available. The IntelliVue solution leverages IT best practices such as:

- L3 support between IntelliVue Patient Monitors, Surveillance PIIC iX, and Server iX.
- Ability to virtualize PIIC iX server platforms.
- Wireless QoS with support for WMM (Wireless MultiMedia).

General networking requirements

- 10Mbps Ethernet, 100Mbps Fast-Ethernet, 1000Mbps Gigabit-Ethernet (802.3,802.3u, 802.3ab/802.3z) support.
- Port Fast, Rapid PVST+, or MSTP/RSTP (802.1s/802.1D) Spanning Tree for Layer 2 Redundancy.
- Protocol Independent Multicasting (PIM) in Sparse or Sparse-Dense Mode.
- IGMP/CGMP snooping on each VLAN.

Network management recommendations and requirements

- Syslog should be enabled in the customer-supplied network switches for port monitoring analysis and change tracking.
- All shared trunks on which ICN VLANs operate should be monitored. An alarm threshold of 80% should be set on every gigabit link utilizing effective annunciation and response to alarms.
- Internet Control Message Protocol (ICMP) ping access is allowed between the Hospital LAN and the ICN with some restrictions.

Layer 2 networking requirements and recommendations

- The ICN requires a unique VLAN or set of VLANs.
- A redundancy protocol that converges in less than 20 seconds (maximum), such as a rapid spanning tree protocol (e.g. Multiple Spanning-Tree (MST) or Per VLAN Spanning Tree Plus (PVST+)).
- Only IntelliVue monitors and PIIC iX or PIIC systems can exist on an ICN VLAN.
- PIIC and PIIC iX devices may not be placed within the same VLAN.
- The recommended VLAN VTP mode of the network switches is transparent mode.

Layer 3 network requirements and recommendations

- A redundant Layer 3 infrastructure, using a Layer 3 router redundancy protocol that converges in 15 seconds or less is required.
- Multicast IGMP snooping must be enabled for PIIC iX systems. IntelliVue Patient Monitors and systems use multicast messaging for association, care-group and alarm reflector communications.
- Philips requires that a block of multicast addresses be reserved. The amount of multicast addresses to reserve is based on the number of Clinical Units.
- A minimum of two layer 3 interfaces is required per subnet.
- Hot Standby Routing Protocol (HSRP), Virtual Router Redundancy Protocol (VRRP), or an equivalent method of redundancy failover protocol is required.
- If a Layer 3 switch is used with VLAN interfaces, all Layer 2 requirements must be met (Internet Group Management Protocol (IGMP) snooping, etc.).
- The Layer 3 interfaces for the ICN subnets must be able to be pinged from IntelliVue Patient Monitors and systems on the ICN.

Network performance requirements

In general, the network design and bandwidth allocation requirements for the IntelliVue Clinical Network(s) are addressed by:

- Creating separate dedicated links for the ICN VLANs.
- Setting up load balancing using redundant links to each network switch.
- Defining EtherChannel Links and Channel Groups between network switches.
- Implementing Quality of Service (QoS)/Class of Service (CoS) throughout the network.

Network Latency and Jitter

- The maximum latency between an IntelliVue monitor and the following devices shall not exceed 100ms:
  - Surveillance or information center.
  - PIIC iX or PIIC database Server.
- The maximum latency between all other ICN devices shall not exceed 30ms.
- Jitter should be no greater than 5% of average round trip time (RTT).

Class of Service (CoS)/Quality of Service (QoS)

- It is recommended that QoS is implemented throughout the network, end to end. QoS is required when trunks between switches are shared between clinical and non-clinical subnets, or when ICN VLANs are routed to other ICN VLANs across a customer network or backbone.
- The specific method of implementing QoS is hospital specific. CoS, IP Precedence, or Differentiated Services Code Point (DSCP) are all methods that may be used. The ICN clinical traffic is similar to voice over IP (VoIP) telephony traffic in that it is sensitive to data loss and jitter, and is similar to signaling traffic in that it can appear in irregular bursts (depending on the specific applications being used). Some IntelliVue Patient Monitors can provide CoS/QoS tagging for outbound packets, however some other IntelliVue Patient Monitoring system components must be classified upon entry to the network.

IP addressing considerations for PIIC and PIIC iX systems

- PIIC iX supports a flexible IP addressing scheme. For a given deployment, the hospital and Philips must work together to define an IP addressing scheme that takes into account the number of clinical systems being deployed, physical location of the deployed IntelliVue monitors and systems, future needs for additional IP addresses, and whether or not the assigned IP addresses need to be unique within the hospital network.
- PIIC Classic ICN require a /21 block of IP addresses..
- Philips IntelliVue Smart-Hopping subnet requires a /20 block of IP addresses.
- IntelliVue Patient Monitors have full DHCP capabilities (revision J or higher with PIIC iX).

Adherence to requirements

Additional details on all requirements are included in the CSCN specification document. Failure to meet any of the requirements listed in the CSCN Specification may result in the delay or loss of critical patient data or alarms without warning, which can delay diagnosis or treatment and result in life-threatening and irreversible injury to patients.

Philips Healthcare is part of
Royal Philips Electronics

How to reach us

www.philips.com/healthcare
healthcare@philips.com
fax: +31 40 27 64 887

Asia
+852 2821 5888

Europe, Middle East, Africa
+49 7031 463 2254

Latin America
+55 11 2125 0744

North America
+1 425 487 7000
800 285 5585 (toll free, US only)

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